THE DISTRIBUTION OF LANTANA BEETLES (COLEOPTERA: CHRYSOMELIDAE: HISPINAE) IN QUEENSLAND

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Abstract

Results are presented of a survey for five species of hispine beetles released for the biocontrol of lantana (*Lantana camara* Linnaeus): *Octotoma scabripennis* Guérin-Méneville, *O. championi* Baly, *Uroplata girardi* Pic, *U. fulvopustulata* Baly and *U. lantanae* Buzzi & Winder. Surveys of coastal and sub-coastal Queensland were carried out from 1995 to 1997 and show the present distribution of *U. girardi*, *U. fulvopustulata* and *O. scabripennis*. Of these, *U. girardi* is the most widely established, found in coastal and sub-coastal areas from Cooktown in north Queensland to New South Wales. *Octotoma championi* and *U. lantanae* were not found during the survey.

Introduction

Lantana is a major weed of areas east of the Great Dividing Range in Queensland and New South Wales (Parsons and Cuthbertson 1992). Since 1914, 23 insect species have been released in Australia for lantana biocontrol, many of which failed to establish (Julien 1992). Of the established agents, two leaf-mining beetles, *Uroplata girardi* Pic and *Octotoma scabripennis* Guérin-Méneville, are considered to be highly effective (Willson 1975, Taylor 1989). However, the effectiveness of these species is thought to be limited by climate (Harley 1969, Cilliers 1987, Cilliers and Neser 1991, Neser and Cilliers 1989). In Hawaii, Harley (1969) observed that *O. scabripennis* favoured hot exposed conditions, whilst *U. girardi* preferred cooler semi-shaded conditions. To increase the likelihood of controlling lantana, a 'cool' climate strain of *U. girardi* and three other species were released in Queensland and New South Wales between 1975 and 1981: *O. championi* Baly, *U. fulvopustulata* Baly (= *Uroplata* sp. near *bilineata* Chapuis) and *U. lantanae* Buzzi & Winder (Willson 1975, Taylor 1989, Julien 1992).

Surveys were conducted in the mid-1970's to determine the Queensland distribution of these beetles (Willson 1975), but no surveys had been conducted since. A school program, 'Beetle Watch', was developed to survey current beetle populations. This program was based on similar school-based programs in Australia such as Bioscan (Allen *et al.* 1995), Pasture Watch (Forge 1992) and Worm Watch (Colliver 1992). In January 1996, March 1996 and May-December 1997, I surveyed lantana areas to obtain additional information on hispine distribution.

Materials and methods

Adult identification

Based solely on colour, the different genera are easy to distinguish. The two *Octotoma* species are black, *Uroplata* are brown (Fig. 1). Although the two *Octotoma* species are similar in colour and size, the shape of the elytra

differs; the elytra of *O. championi* widen or 'flare' at the caudal end (Fig. 1). Similarly, it is possible to distinguish between the two *Uroplata* species. Taylor (1989) suggested that the 'cool climate' biotype of *U. girardi* is distinguishable from the common strain by a variation in colour on the elytra and pronotum. No specimens of *U. lantanae* were available for identification purposes.

Larval identification

The larval mines of *O. scabripennis* and *U. girardi* differ in shape (Fig. 1). The central mine of *O. scabripennis* is usually located near the mid-vein and is not as tortuous as that of *U. girardi* (Willson 1975). The mine shapes of larval *U. girardi* and *U. fulvopustulata* also differ, the feeding galleries of *U. fulvopustulata* tending to be linear (Fig. 1).

Survey method 1 - Beetle Watch

The Beetle Watch program was developed for primary school children (grades 5-7, aged 9-12). This program had two main aims: to educate children about the process of biological control and to collect information on hispine distribution. In March 1995 kits, consisting of booklets, resin-embedded specimens of *O. scabripennis* and *U. girardi* and collection bottles, were sent to 200 schools and individuals of the CSIRO Double Helix Club interested in participating in the program.

Lantana was surveyed on a single occasion (at one or more sites) between May and December 1995. Beetles were hand collected from lantana and specimens (adults beetles only) were returned to me. On receipt the specimens were identified and counted. The school or individual's name, site (latitude and longitude), collection date, species collected and number of bushes sampled were entered into a database.

Survey method 2

In January and March 1996, I surveyed lantana at 30 km intervals along the Queensland coast from Beenleigh (27°43'S) to Cairns (16°54'S), and at infrequent intervals (spatially and temporally) between Cairns and Seisia (nr Bamaga: 10°53'S) during May-December 1997. At each site plants were examined and the presence of adult beetles or larval mines were recorded. An estimate of abundance was obtained by counting the total number of larval mines and/or adults present on a total of five plants. From this an average number of beetles/plant was calculated. Samples were collected and labelled with site number and collection date. This information together with cultivar type and abundance data was entered into a database.

Results

The two surveys differed from each other in the total number of sites surveyed, but the overall trends in hispine abundance and distribution were similar. Fifty-eight sites were surveyed in the Beetle Watch program (51 participants), 151 sites in the second survey. *Uroplata girardi* was identified by the Beetle Watch program as the most common species (36 sites),

followed by *O. scabripennis* (29 sites) and *U. fulvopustulata* (1 site); *O. championi* and *U. lantanae* were not recovered. These trends were similarly observed in the second survey (*U. girardi* = 92 sites, *O. scabripennis* = 39 sites, *U. fulvopustulata* = 15 sites; no *O. championi* or *U. lantanae* found). Few beetles were found at inland sites between Maryborough and Rockhampton or at sites between Townsville and Mackay (Fig. 2 A,B,C).

Current distribution and changes to the 1975 distribution

The distributions of *U. girardi* and *O. scabripennis* appear to have changed since the study by Willson (1975). *Uroplata fulvopustulata* was not released until 1976 and hence was not studied by Willson (1975); therefore no comment can be made on any changes to its distribution.

Uroplata girardi

Uroplata girardi is found in coastal and sub-coastal sites from Brisbane to Cooktown; particularly near Brisbane, Toowoomba, Bundaberg, Mackay, Atherton and Daintree. This species appears to have extended its range from Mackay through to Rockhampton. There were minor extensions to its distribution north of Cairns and around Atherton and Cooktown (Fig. 2A).

Uroplata fulvopustulata

Uroplata fulvopustulata is restricted to sites in north Queensland from Cardwell through to Cape Tribulation (Fig. 2B).

Octotoma scabripennis

In southern Queensland the distribution of *O. scabripennis* is limited to sub-coastal and coastal sites near Brisbane, Maryborough and Bundaberg. There has been an extension to its range from Maryborough through to Bundaberg. In northern Queensland, *O. scabripennis* has established in areas west of Mackay and on the Atherton Tableland (Fig. 2C).

Discussion

Comparison of sampling methods

The two methods varied in the number of sites surveyed. Almost twice as many sites were sampled in the second survey compared to the first (Beetle Watch). The costs of the two methods also differed: the Beetle Watch program cost about $15,000 to produce and administer, whilst the second survey cost about $9,600. However, Beetle Watch had another benefit that is not easily measured: as an education tool. The advantages and disadvantages of this method will be discussed in a subsequent paper (Broughton in prep.).

1995-1997 distribution of lantana beetles

The results of the two surveys show that hispines are found almost wherever lantana occurs. The most common species identified by this study were *O. scabripennis* and *U. girardi* but *U. girardi* has a much wider distribution. Only one other species appears to have established in Queensland, *U. fulvopustulata* in the north. Although no specimens of the 'cool climate' strain of *U. girardi* were recovered, populations might persist in New South Wales (Taylor 1989). The other two species, *O. championi* and *U. lantanae,*

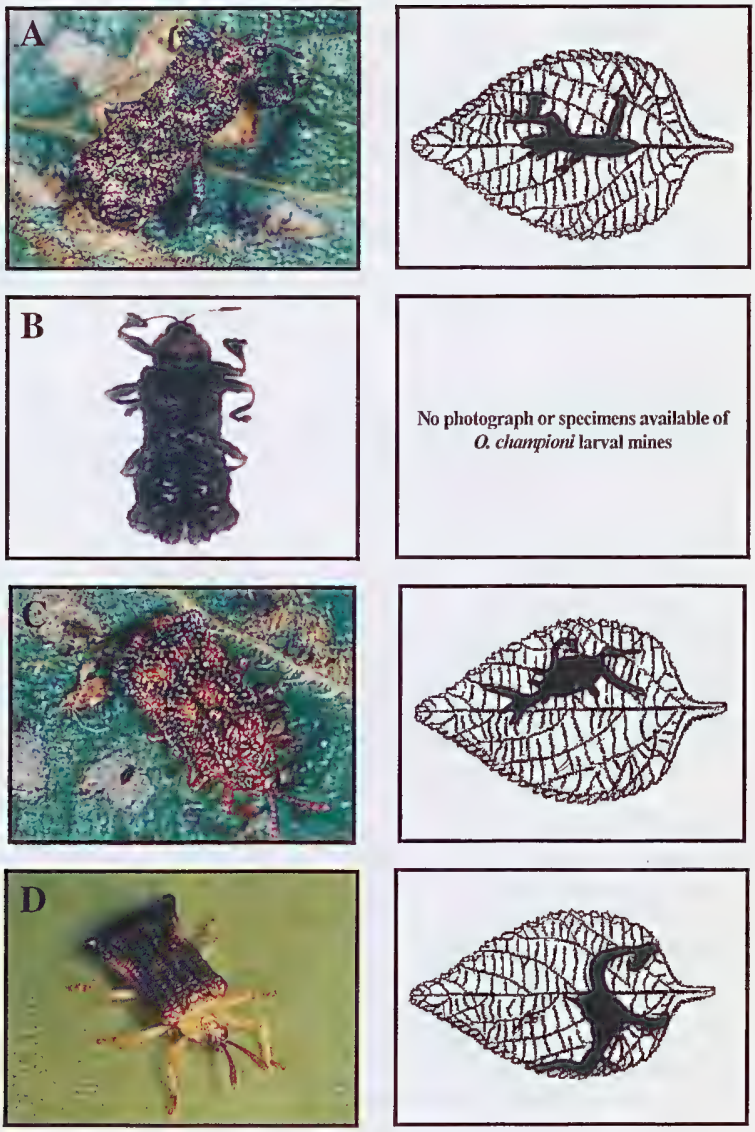

Fig. 1. Adults and larval mines of lantana beetles: (A) *Octotoma scabripennis*; (B) *O. championi*; (C) *Uroplata girardi*; (D) *U. fulvopustulata.*

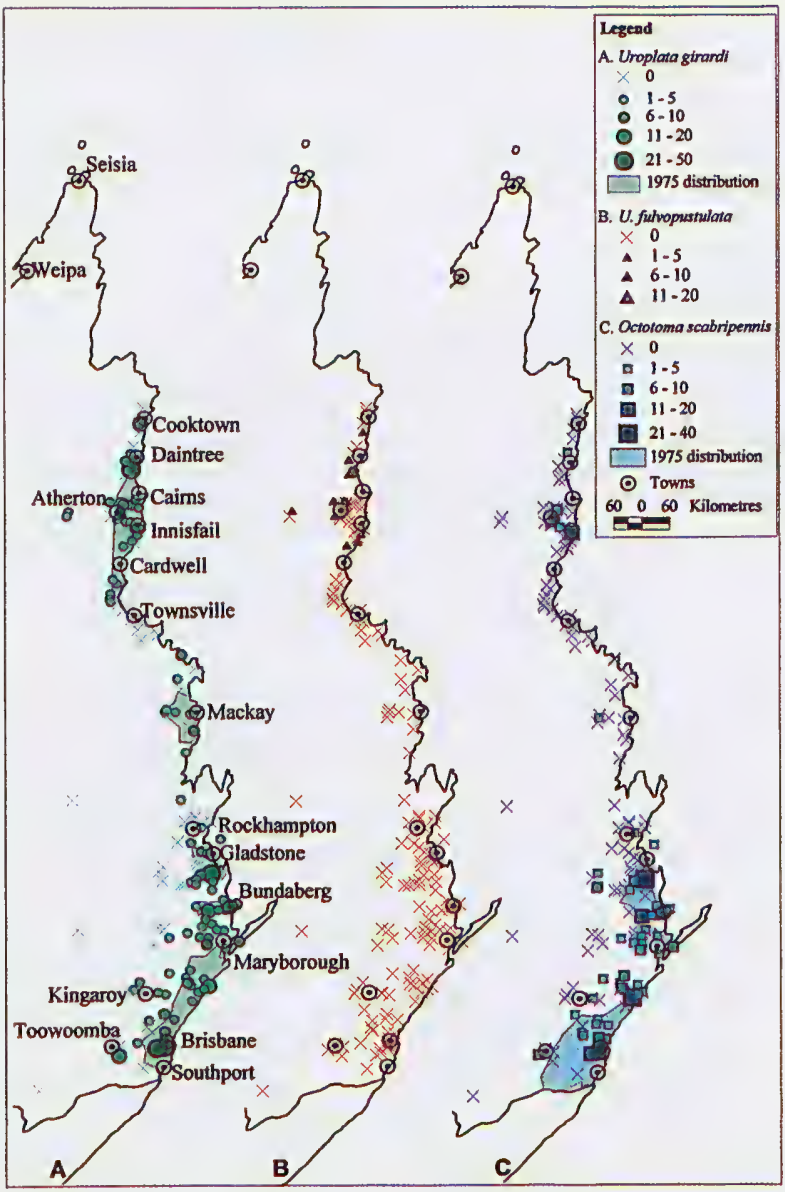

Fig. 2. Distribution of lantana beetles in 1995-97: (A) *Uroplata girardi*; (B) *U. fulvopustulata*; (C) *Octotoma scabripennis*. Legend refers to the average number of beetles/plant.

were not recovered during this study. However, *O. championi* became established in New South Wales around Sydney (Taylor 1989).

The distributions of all three species overlap, which suggests that the release of additional strains and species of *Uroplata* and *Octotoma* has failed to increase the distribution of these beetles in Queensland. Whether control has increased in northern Queensland as a result of the establishment of *U. fulvopustulata*, or in New South Wales with the establishment of *O. championi*, is not known.

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